SPECIFICATION AMENDMENTS

On page 1, insert above line 1, insert--Priority Claim

The present application claims priority on European Patent Application 03254738.2 filed July 29, 2003.--

On page 1, above line 1, insert--Field of the Invention--

Paragraph on line 1 of page 1 has been amended as follows:

--The present inventions relates to a system and a method for sealing a space in a wellbore formed in an earth formation, the earth formation containing formation water susceptible of flowing into the wellbore.--

On page 1, above line 5, insert--Background of the Invention

Paragraph on line 4 of page 2 has been amended as follows:

--The installed casing sections may be ~~are in the conventional well construction process~~ fixed and sealed in the wellbore by pumping a layer of cement between the casing and the wellbore wall. Alternatively, the casing may be expanded against the wellbore wall. This technology could be applied to the Expandable Open Hole Liner, as well. The sealing function of the cement layer relates to the requirement that migration of formation fluids, such as formation water, through the annular space between the casing and the wellbore wall should be prevented. However it has been experienced that adequate sealing by pumping a layer of cement in the annular space, is sometimes difficult to achieve. For example if the drilling fluid used to drill the wellbore is not fully replaced by cement in the annular space, or if adequate filling of the annular space with cement is hampered by irregularities in the wellbore wall, there is a risk that formation fluids migrate in axial direction through the annular space.--

On page 3, above line 32, insert--Summary of the Invention--

Paragraph on line 32 of page 3, ending on line 2 of page 4, has been amended as follows:

--~~It is an object of the~~ The present inventions ~~to~~ provide an improved system for sealing a space in a wellbore formed in an earth formation~~, which overcomes the drawbacks of the prior art~~.--

Paragraph on line 2 of page 4 has been amended as follows:

--In accordance with one embodiment of the invention there is provided a system for sealing a space in a wellbore formed in an earth formation, comprising a swelleable body arranged in the wellbore in a manner so as to seal said space upon swelling of the swelleable body, the swelleable body being susceptible of being in contact with formation water flowing into the wellbore, the swelleable body ~~including~~ comprising a matrix material provided with a compound soluble in said formation water, wherein the matrix material substantially prevents or restricts migration of the compound out of the swelleable body and allows migration of said formation water into the swelleable body by osmosis so as to induce swelling of the swelleable body upon migration of said formation water into the swelleable body.--

Paragraph on line 18 of page 4 has been amended as follows:

--Some of the embodiments of the~~The~~ invention also relates to a method of sealing a space in a wellbore formed in an earth formation, the method comprising arranging a swelleable body in the wellbore in a manner so as to seal said space upon swelling of the swelleable body, the swelleable body being susceptible to ~~of~~ being in contact with formation water flowing into the wellbore, the swelleable body comprising ~~including~~ a matrix material provided with a compound soluble in said formation water, wherein the matrix material substantially prevents or restricts migration of the compound out of the swelleable body and allows migration of said formation water into the swelleable body by osmosis so as to induce swelling of the swelleable body upon migration of said formation water into the swelleable body.--

On page 5, delete line 1-33.

On page 6, delete line 1-33.

On page 7, delete line 1-33.

On page 8, delete line 1-9.

On page 8, above line 10, insert--Brief Description of the Drawings--

Paragraph on line 10 of page 8 has been amended as follows:

--The present invention is better understood by reading the following description of non-limitative embodiments with reference to the attached drawings, wherein like parts of each of the figures are identified by the same reference characters, and which are briefly described as follows: ~~The invention will be described further in more detail and by way of example, with reference to the accompanying drawing in which:~~

On page 8, above line 32 insert--Detailed Description of the Invention--

On page 8, delete line 32-33.

On page 14, after line 2, insert the following:

-- To prevent or reduce leaching of said compound out of the body of swelleable material, it is preferred that said body includes a matrix material substantially impermeable to said compound or to ions formed of said compound.

Preferably the matrix material includes a polymer matrix material, for example a thermoset elastomer matrix material or a thermoplastic elastomer matrix material.

In a preferred embodiment the polymer matrix material is obtained or obtainable by mixing the compound in a mass of polymer material and thereafter vulcanizing the mass of polymer material to form said polymer matrix material. For example, the compound is formed by salt particles, which are mixed into the mass of polymer material prior to cross-linking (vulcanization) thereof, followed by cross-linking of the polymer material to form the elastomer matrix material in which the salt particles are embedded.

Suitable thermoset elastomer materials capable of withstanding the high wellbore temperatures for a prolonged period of time are:

1) rubber materials which, apart from swelling in water, also swell in crude oil present in petroleum wells, such as Ethylene Propylene Rubber (EPM and EPDM), Ethylene-Propylene-diene Terpolymer rubber (EPT), butyl rubber (IIR), brominated butyl rubber (BIIR), chlorinated butyl rubber (CIIR), chlorinated polyethylene (CM/CPE), neoprene rubber (CR), styrene butadiene copolymer rubber (SBR), sulphonated polyethylene (CSM), ethylene acrylate rubber (EAM/AEM), epichlorohydrin ethylene oxide copolymer (CO, ECO), Silicone Rubbers (VMQ) and Fluorsilicone Rubber (FVMQ);

2) rubber materials which do not swell in crude oil, such as Butadiene acrylonitrile copolymer (Nitrile Rubber, NBR), Hydrogenated NBR (HNBR, HNS) such as ZETPOL®, TORNAC®, TERBAN®, NBR with reactive groups (X-NBR), Fluoro Rubbers (FKM), such as VITON®, FLUOREL®, Perfluoro Rubbers (FFKM) such as KALREZ®, CHEMRAZ® and Tetrafluorethylene/propylene (TFE/P), such as AFLAS®, which would not swell when exposed to oil field crudes.

Most of these elastomers can be crosslinked by more than one crosslinking agent (e.g. either "Sulphur cross-linked of Peroxide cross-linked).

Apart from the thermoset (non swelling and oil swelling) elastomer matrix materials quoted above, also blends of elastomers can be applied ('elastomeric alloys'). Although an almost inexhaustible combination of thermoplastic and thermoset elastomers are feasible, the most preferable are the EPDM/Polypropylene blends such as SARLINK®, Levaflex®, Santoprene®, NBR- Polypropylene blends such as GEOLAST®, NBR/Polyvinylchloride blends and NR/Polypropylene blends. All of these have a tendency to swell in Petroleum crudes, especially at the targeted downhole well temperatures.

Preferably said compound is incorporated in a plurality of particles homogeneously distributed through the matrix material.

Suitable particles are fine particles of salt, preferably dissociating salt, which can be uniformly compounded into the base rubber. For example extremely fine salt particles which are water soluble are applied, the salt being selected from the group of: acetates; M-(CH_3COO), bicarbonates; M-(HCO_3), carbonates; M-(CO_3), formates M-(HCO2), halides; Mx-Hy (H = Cl, Br or I), hydrosulphides; M-(HS), hydroxides; M-(OH), imides; M-(NH), nitrates; M-(NO3), nitrides; M-N, nitrites; M-(NO_2), phosphates; M-(PO4), sulphides; M-S and sulphates; M-(SO_4), where M can be any metal of the periodic table. Other salts are can be applied where the cation is a non-metal like NH_4Cl.

However the preferred salts are NaCl and $CaCl_2$.

To limit leaching out of the salt from the elastomer, suitably the swelleable body includes any hydrophilic polymer containing polar groups of either oxygen or nitrogen in the backbone or side groups of the polymer. These side groups can be partially or fully neutralised. Polymers of such type are, for example, hydrophilic polymer types such as alcohols, acrylates, methacrylates, acetates, aldehydes, ketones, sulfonates, anhydrides, maleic anhydrides, nitriles, acrylonitriles, amines, amides, oxides (polyethylene oxide), cellulose types including all derivatives of these types, all copolymers including one of the above all grafted variants.

Suitably a ternary system is applied which includes an elastomer, a polar SAP and a salt, whereby the polar SAP is grafted onto the backbone of the elastomer. Such system has the advantage that the polar SAP particles tend to retain the salt particles in the elastomer matrix thereby reducing leaching of the salt from the elastomer. The polar salt is attracted by electrostatic forces to the polar SAP molecules, which are grafted ('glued') to the backbone of the rubber.

Generally the swelleable body should be capable of swelling in water of salinity as high as 140 g/Sodium Chloride, and containing considerable concentrations of bivalent ions, such as at least 40 g/l Calcium Chloride and 8 g/l Magnesium Chloride, and at temperatures of at least 40 °C but preferably 100-150 °C which is typical for the static bottom hole temperatures of petroleum wells. The transition from non-swollen to fully swollen state preferably takes place within a timeframe of 2-3 weeks, and the swollen state should be maintained for a period of at least one year.--

Insert the following paragraph at the end of the last paragraph above:

--Those of skill in the art will appreciate that many modifications and variations are possible in terms of the disclosed embodiments, configurations, materials, and methods without departing from their spirit and scope. Accordingly, the scope of the claims appended hereafter and their functional equivalents should not be limited by particular embodiments described and illustrated herein, as these are merely exemplary in nature.--

On page 15, above line 1, insert --We claim:--